

Name: Solutions

1. Solve $\frac{14}{12} = \frac{2a}{3}$

$$\frac{7}{6} = \frac{2a}{3}$$

$$3 \cdot 7 = 6 \cdot 2a$$

$$21 = 12a$$

$$\frac{21}{12} = a$$

$$a = \frac{7}{4}$$

$$\left\{ \frac{7}{4} \right\}$$

2. Solve $\frac{15}{x+7} = \frac{45}{x+21}$

$$\frac{1}{x+7} = \frac{3}{x+21}$$

$$1(x+21) = 3(x+7)$$

$$x+21 = 3x+21$$

$$0 = 2x$$

$$0 = x$$

$$\{0\}$$

3. Solve $\frac{3+2x}{3-2x} = -3$

$$3+2x = -3(3-2x)$$

$$3+2x = -9+6x$$

$$3 = -9+4x$$

$$12 = 4x$$

$$3 = x$$

$$\{3\}$$

4. Solve $\frac{k+4}{3} = \frac{k+7}{5} + \frac{k}{7}$

$$\cancel{2} \cdot 5 \cdot 7 \frac{k+4}{\cancel{3}} = \cancel{3} \cdot \cancel{5} \cdot 7 \frac{k+7}{\cancel{5}} + \cancel{3} \cdot 5 \cdot 7 \frac{k}{\cancel{7}}$$

$$35(k+4) = 21(k+7) + 15k$$

$$35k + 140 = 21k + 147 + 15k$$

$$35k = 36k + 7$$

$$-7 = k$$

$$\{-7\}$$

5. Solve $1 = \frac{1}{3}(x+6) - \frac{1}{6}(9-x)$

$$6 \cdot 1 = 6 \cdot \frac{1}{3}(x+6) - 6 \cdot \frac{1}{6}(9-x)$$

$$6 = 2(x+6) - (9-x)$$

$$6 = 2x + 12 - 9 + x$$

$$6 = 3x + 3$$

$$3 = 3x$$

$$1 = x$$

$$\{1\}$$

6. Solve $\frac{1}{y-3} = \frac{6}{y^2-9}$

$$\cancel{(y+3)}\cancel{(y-3)} \frac{1}{\cancel{y-3}} = \cancel{(y+3)}\cancel{(y-3)} \frac{6}{\cancel{(y-3)}\cancel{(y+3)}}$$

$$y+3 = 6$$

$$y \neq 3$$

$\{-\}$ called the empty set

no solution

7. Solve $\frac{x}{x+1} + \frac{x+1}{x} = \frac{5}{2}$

$$\cancel{2x} \cancel{(x+1)} \frac{x}{\cancel{x+1}} + \cancel{2x} \cancel{(x+1)} \frac{x+1}{\cancel{x}} = \cancel{2x} \cancel{(x+1)} \frac{5}{2}$$

$$2x^2 + 2(x+1)(x+1) = 5x(x+1)$$

$$2x^2 + 2(x^2 + 2x + 1) = 5x^2 + 5x$$

$$2x^2 + 2x^2 + 4x + 2 = 5x^2 + 5x$$

$$0 = x^2 + x - 2$$

$$0 = (x+2)(x-1)$$

$$x = -2 \quad x = 1$$

8. Solve. $\frac{x}{6} - \frac{x+3}{5} = 1$

$$\cancel{6} \cdot 5 \cdot \frac{x}{\cancel{6}} - \cancel{6} \cdot 5 \cdot \frac{x+3}{\cancel{5}} = \cancel{6} \cdot 5 \cdot 1$$

$$\{-2, 1\}$$

$$5x - 6(x+3) = 30$$

$$5x - 6x - 18 = 30$$

$$-x - 18 = 30$$

$$-x = 48$$

$$x = -48$$

$$\{-48\}$$

9. Solve. $\frac{4}{x+2} - \frac{1}{x} = \frac{1}{3}$

$$3x(x+2) \cdot \frac{4}{x+2} - 3x(x+2) \cdot \frac{1}{x} = 3x(x+2) \cdot \frac{1}{3}$$

$$3x \cdot 4 - 3(x+2) = x(x+2)$$

$$12x - 3x - 6 = x^2 + 2x$$

$$9x - 6 = x^2 + 2x$$

$$0 = x^2 - 7x + 6$$

$$0 = (x-1)(x-6)$$

10. Solve $\frac{2}{x-1} + x = 5$

$$(x-1) \cdot \frac{2}{x-1} + (x-1)x = (x-1)5 \quad \{1, 6\}$$

$$2 + x^2 - x = 5x - 5$$

$$x^2 - 6x + 7 = 0$$

$$x = \frac{6 \pm \sqrt{36 - 28}}{2} = \frac{6 \pm \sqrt{8}}{2} = \frac{6 \pm 2\sqrt{2}}{2} = 3 \pm \sqrt{2}$$

$$\{3 + \sqrt{2}, 3 - \sqrt{2}\}$$

11. Solve $1 = \frac{3}{x+2} + \frac{1}{x-2}$

$$(x+2)(x-2) = (x+2)(x-2) \cdot \frac{3}{x+2} + (x+2)(x-2) \cdot \frac{1}{x-2}$$

$$(x+2)(x-2) = 3(x-2) + x+2$$

$$x^2 - 4 = 3x - 6 + x + 2$$

$$x^2 - 4x = 0$$

$$x(x-4) = 0$$

$$\{0, 4\}$$

12. Solve $\frac{1}{x+1} + 1 = \frac{x+2}{3}$

$$3(x+1) \cdot \frac{1}{x+1} + 3(x+1) \cdot 1 = 3(x+1) \cdot \frac{x+2}{3}$$

$$3 + 3x + 3 = (x+1)(x+2)$$

$$3 + 3x + 3 = x^2 + 3x + 2$$

$$0 = x^2 - 4$$

$$0 = (x-2)(x+2)$$

$$\{2, -2\}$$